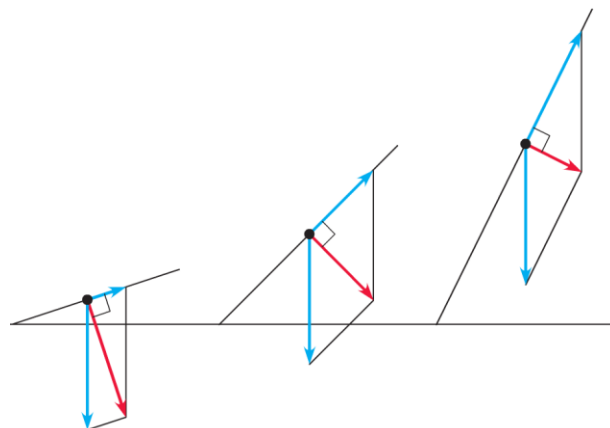


3.20 Applications of Vectors

Example: Forces of 2 lb and 12 lb are acting at an angle of 72° to each other. Find the magnitude of the resultant force and the angle between the resultant and each force.

Inclined Plane Problems: The weight of an object is always modeled as a vertical vector and the force required to move the object is modeled as a vector parallel to the inclined plane. Its length increases as the incline increases. The resultant of these two forces is a vector perpendicular to the inclined plane. It is what a bathroom scale would read if trapped between the object and the plane.

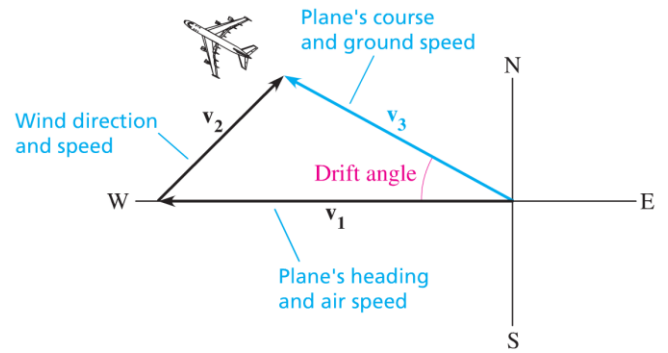


Example: Find the amount of force required to push an 800-pound block of ice up a ramp that is inclined 10° .

Example: A landscaper uses 100 pounds of force to pull a cart full of rocks up a driveway that is inclined 15° . What is the weight of the cart?

Example: If 300 pounds of force is required to push a 1000-pound safe up a ramp, then what is the angle of inclination of the ramp?

Navigation Problems: Wind affects the speed and direction of a plane. The **heading** and **air speed** are the direction and speed of the plane before wind is taken into account. The **course** and **ground speed** are the direction and speed of the plane with wind taken into account. The angle between the heading and the course is the **drift angle**.



Example: An airplane is headed due east with an air speed of 200 mph. The wind is out of the south (bearing 0°) at 40 mph. Find the drift angle, the ground speed, and the course of the airplane.

Example: An airplane is headed due west with an air speed of 400 mph. The wind is out of the northwest (bearing 135°) at 90 mph. Find the drift angle, the ground speed and the course of the airplane.

Example: A jet is headed northwest with an air speed of 500 mph. The wind is 100 mph with a bearing of 200° . Find the drift angle, the ground speed, and the course of the jet.